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SPRING MOTH ACTIVITY IN RELATION TO LOCALITY, TEMPERATURE AND AIR PRESSURE

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INTRODUCTION

THIS PAPER SUMMARIZES THE RESULTS of studies conducted with blacklight traps in Fulton County and Craighead County, Arknsas, on four species of moths which are active during the first one-third of the year, 1970. Three of these moths are noctuids: *Eupsilia sidus* (Guenee), *Taeniocampa garmani* (Grote), and *Phoberia atomaris* (Hubner). The fourth is a geometrid: *Hyrdiomena mississippiensis* (McDunnough). These moths began appearing very early in the year, and by May 1, 1970, their activity appeared to be at an end. Records were kept on the number of moths trapped, the daily high temperatures, daily mean temperatures, and atmospheric pressure. The purpose of this study was to relate weather conditions to activity patterns and to compare these factors in two dissimilar counties.

Blacklight lamp traps are useful in insect research and surveys. They can be used to determine the periods of greatest activity, the distribution, and seasonal abundance of a number of insect species (Comstock, 1879; Hollingsworth, 1963; King, 1960). Recently work has been done on measuring the efficiency of light trap catches in relation to total populations (Falcon, 1967; Hartstack *et al*., 1968; Stewart *et al.*, 1968). Falcon (1967) noted good correlation between the field counts of bollworm eggs and larvae and the mean number of moths collected in the light traps. However, Hartstack *et al.*, (1968) established that efficiency of blacklight traps varied with the species of insect. Stewart *et al.*, (1968) noted that various species were trapped more efficiently at different heights.

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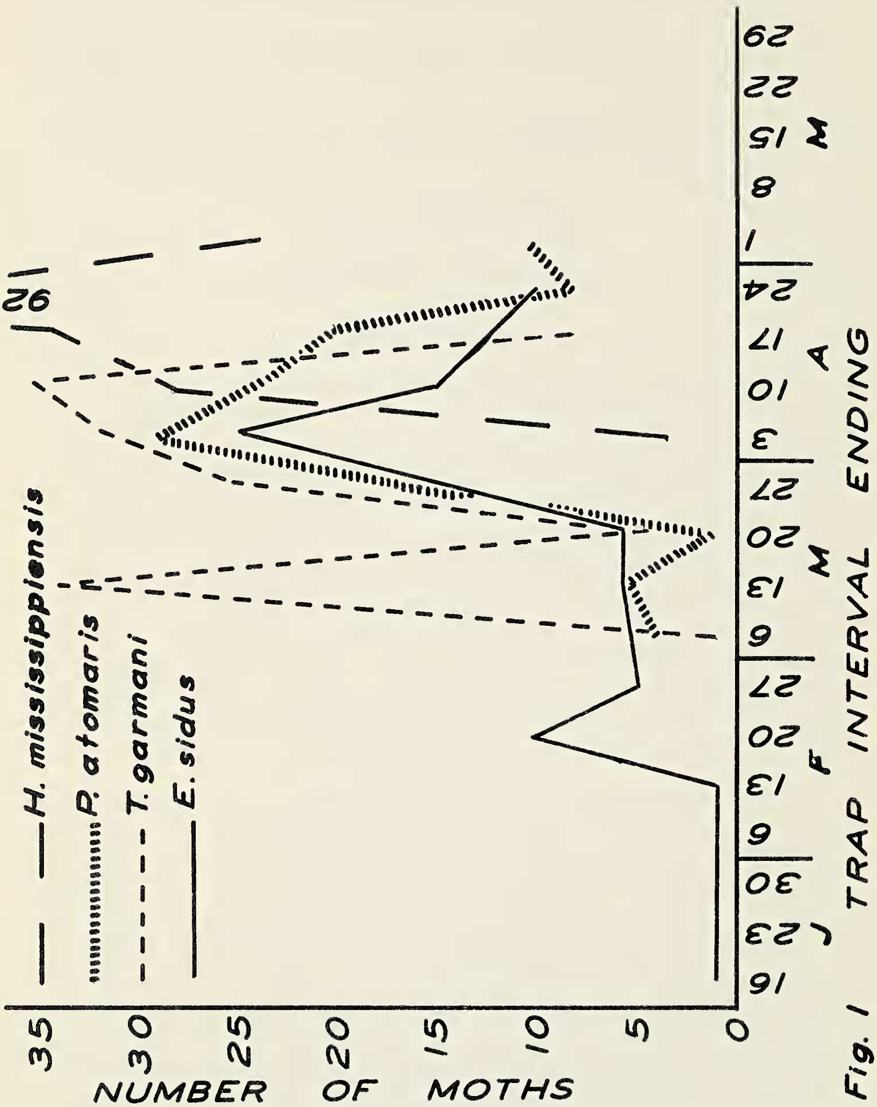
H. mississippiensis
P. atomaris
T. garmani
E. sidus
92
35
30
25
20
15
10
5
0
NUMBER OF MOTHS
16
23
30
6
13
20
27
6
13
20
27
3
10
17
24
1
8
15
22
29
J
F
M
A
M
TRAP INTERVAL ENDING

Fig. 1

Studies have been made on the effects of temperature and other weather factors in relation to insect activity, population, and emergence (King, 1962, 1966; Williams, 1939, 1940). Williams (1940) studied activity effects, while King (1962) demonstrated a relationship between emergence and rainfall.

METHODS AND MATERIALS

Two traps were utilized in this study, each equipped with omnidirectional, 15-watt blacklight lamps. The traps were modified from Falcon (1967) by using a one-gallon jar containing 70 percent isopropyl alcohol for collecting the moths. The traps were emptied daily.

One trap was located three miles south-west of Mammoth Spring, in Fulton County, Arkansas, which is in the Ozark Highlands. The area is primarily oak-hickory forest. The small percentage of land which is cleared is largely in pasture. The second trap was located approximately eighty miles south-east of Mammoth Spring, four miles north-east of Jonesboro in Craighead County, Arkansas. Craighead County is in the Mississippi alluvial plain, and the greatest percentage of the land is in tillage.

Climatological data for the Jonesboro trap was obtained from Federal Aviation Administration records at Jonesboro, Arkansas, and was recorded approximately three miles from the trap. Weather information for the Fulton County trap was obtained from Radio Station KALM where weather is recorded daily. The radio station is located approximately five miles north-west of the Fulton County trap.

RESULTS

T. garmani — A total of 269 specimens was taken from both traps. Only nine of these were taken in Craighead County. They first appeared in both the Fulton County and the Craighead County traps during the week of March 6 (Fig. 1). Activity was at its greatest from March 8 to April 11. Population peaks occurred when the daily mean temperature reached 50°F. (Fig. 3). This seems to indicate that the optimum temperature for *T. garmani* activity is 50°F. The only peak reached on the daily high temperature was 72°F. (Fig. 2). It is interesting that large numbers were continually trapped in Fulton County at atmospheric pressures over 29.95 inches (Fig. 4). This was not the case with the other moths under consideration .

P. atomaris — A total of 135 specimens was taken from both traps. Only four were taken in Craighead County. The first

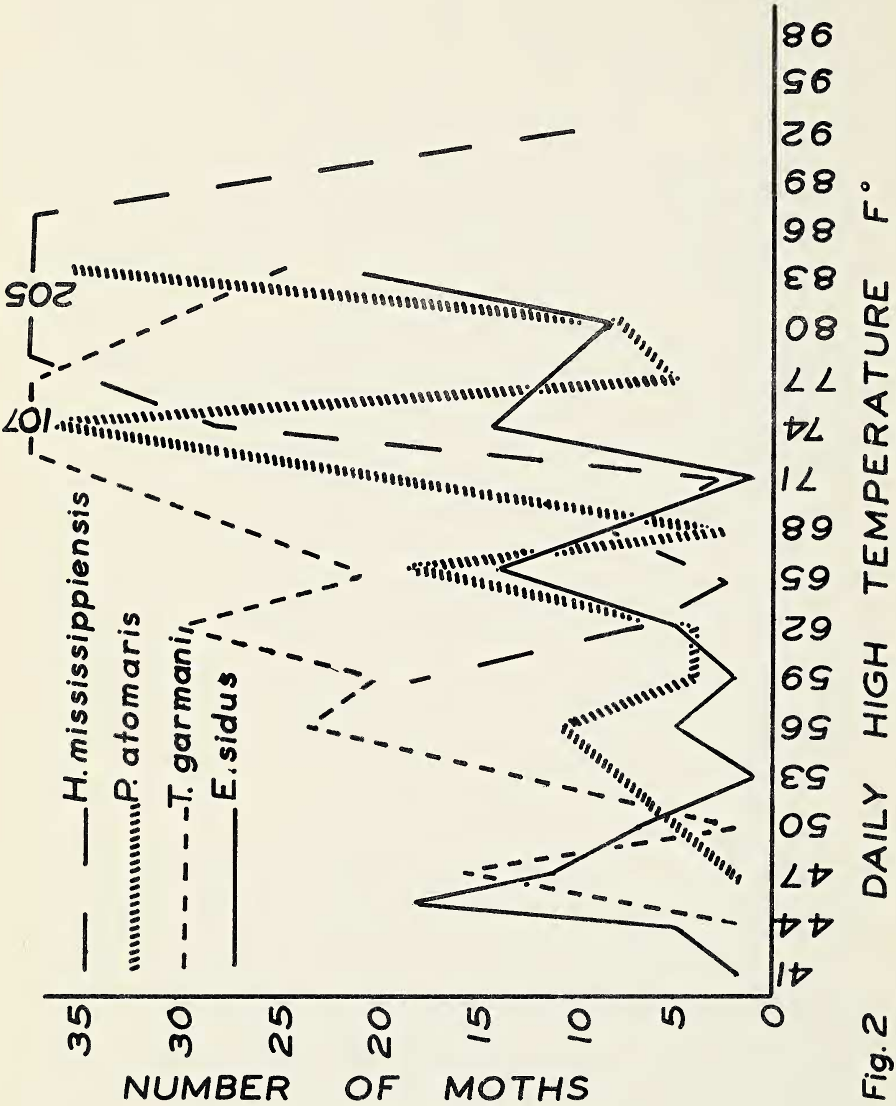
H. mississippiensis
P. atomaris
T. garmani
E. sidus
205
107
35
30
25
20
15
10
5
0
NUMBER OF MOTHS
41
44
47
50
53
56
59
62
65
68
71
74
77
80
83
86
89
92
95
98
DAILY HIGH TEMPERATURE F°

Fig. 2

specimens taken in Fulton County came to the trap during the interval beginning March 3 (Fig. 1). A peak was reached during the first week in April and activity ceased on April 29. The greatest number was trapped on April 5. The daily mean temperature showed peaks at 52°F. and 67°F., with a lesser peak at 43°F. (Fig. 3). Activity increased when the daily high temperature was above 72°F. (Fig. 2). Larger numbers of this moth were consistently taken when the atmospheric pressure was 30.20 inches (Fig. 4). Activity dropped off as pressure deviated either side of 30.20 inches.

H. mississippiensis — A total of 321 specimens was taken from both traps. Only sixteen were taken in Craighead County. The first specimen appeared at the Fulton County trap on March 31, and the last one was trapped on April 30 (Fig. 1). The activity reached its height during the third week of April. Catches prior to and following this week were not large (Fig. 1). The daily mean temperature at which the greatest number of these moths was trapped was between 66°F. and 70°F. (Fig. 3). This would suggest an optimum temperature of 68°F. for this moth. When the daily high temperature reached 82°F. moth activity increased (Fig. 2). Again, activity greatly increased when the atmospheric pressure reached 30.20 inches, and activity dropped off with any deviation either side of 30.20 inches (Fig. 4).

E. sidus — A total of 101 specimens was taken from the Fulton County trap alone. None appeared in Craighead County. The first specimen appeared on January 16, while the last one taken appeared on April 24 (Fig. 1). The number of these moths steadily increased until a peak was reached on April 3. The data obtained for the daily high temperature (Fig. 2) and the daily mean temperature (Fig. 3) revealed no correlation to numbers of moths caught. Again, atmospheric pressure was of interest. Like *P. atomaris* and *H. mississippiensis,* the activity of *E. sidus* greatly increased as atmospheric pressure approached 30.20 inches (Fig. 4). It should be noted that if this curve were plotted by using Forbes' (1953) equation, it would indicate a peak at somewhere between 30.15 and 30.20.

CONCLUSIONS AND DISCUSSION

All four moths were found in greater numbers in Fulton County than in Craighead County. This could be attributed to the contrasting topographies of the two counties, the possibility that higher temperatures in Craighead County are less favorable to these moths, the feeding preferences of these moths, or a combi-

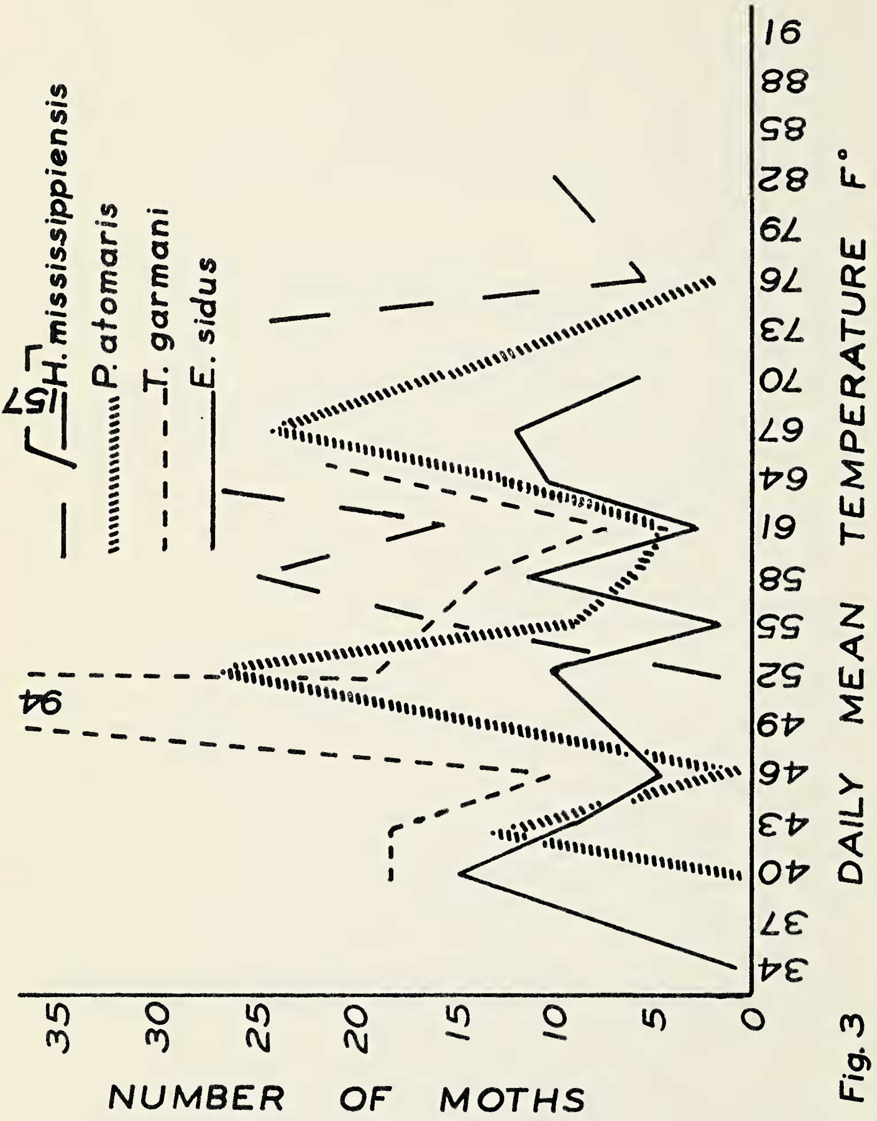
H. mississippiensis
157
P. atomaris
T. garmani
E. sidus
94
NUMBER OF MOTHS
0
5
10
15
20
25
30
35
DAILY MEAN TEMPERATURE F°
34
37
40
43
46
49
52
55
58
61
64
67
70
73
76
79
82
85
88
91

Fig. 3

nation of these factors. All four species had sharply defined population peaks (Fig. 1). *T. garmani* showed two peaks approximately one month apart.

No correlation could be made between daily high temperature and numbers of *E. sidus* and *P. atomaris* (Fig. 2). However, *H. mississippiensis* increased activity each evening after the daily high temperature reached 82°F. This was to be expected since, generally, moth activity increases at higher temperatures. *E. sidus* did not seem to be affected by variations in tempearture.

The daily mean temperature for *P. atomaris* gave no trend (Fig. 3). *H. mississippiensis,* however, did indicate a possible optimum tempertaure of between 66°F. and 70°F. *T. garmani* showed a sharp peak at a daily mean temperature of 50°F. This also was consistent because activity immediately dropped off with any deviation from this 50°F. mean temperature.

Our most interesting data were obtained from atmospheric pressure (Fig. 4). *P. atomaris, E. sidus,* and *H. mississippiensis* indicated a definite trend in that their activity was always at its greatest around 30.20 inches of atmospheric pressure. Any time the atmospheric pressure deviated from this point, there was a sharp decline in the activity of these three moths. *T. garmani* was an exception to this in that it consistently appeared at pressures over 29.95 inches.

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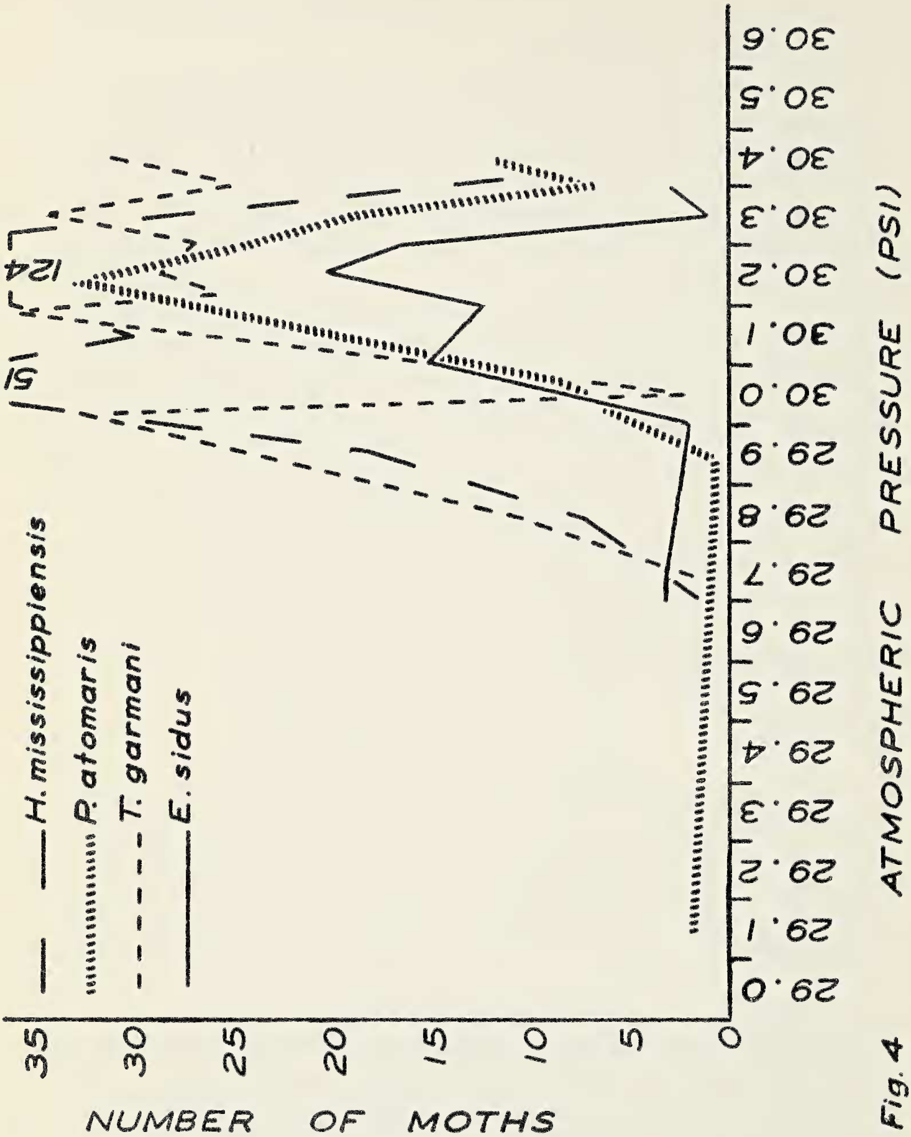
H. mississippiensis
P. atomaris
T. garmani
E. sidus
124
51
NUMBER OF MOTHS
0
5
10
15
20
25
30
35
ATMOSPHERIC PRESSURE (PSI)
29.0
29.1
29.2
29.3
29.4
29.5
29.6
29.7
29.8
29.9
30.0
30.1
30.2
30.3
30.4
30.5
30.6

Fig. 4

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